SEASONAL OUTLOOK

ICE CONDITIONS IN NORTHERN CANADIAN WATERS

SUMMER
1979

PREPARED BY
ICE FORECASTING CENTRAL
OTTAWA

MAY 1979

ENVIRONMENT CANADA
ATMOSPHERIC ENVIRONMENT

ENVIRONNEMENT CANADA
ENVIRONNEMENT ATMOSPHERIQUE

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ICE CONDITIONS IN NORTHERN CANADIAN WATERS

SEASONAL OUTLOOK

*** SUMMER 1979 ***

1. *INTRODUCTION*

This outlook is prepared as a guide to the expected pattern and timing of break-up and clearing of ice from Hudson Bay and other Arctic waters. It is intended to be used for planning operations only, providing information on areas where the break-up pattern may vary signigicantly from average conditions and particularly where later than or less than usual clearing are anticipated. The twice monthly 30-day forecasts and the weekly ice conditions charts which are available will keep planners abreast of the progress of the ice break-up throughout the season. Daily radio broadcasts of plain language forecasts and of ice conditions charts will keep field operators aware of conditions affecting their day to day operations.

The evaluation of ice conditions at mid May incorporates the following data inputs:

a) analysis of the temperatures and wind regimes through the winter and spring;
b) weekly ice thickness measurements through the winter;
c) aerial survey of ice conditions in February;
d) aerial survey of the Davis Strait-Baffin Bay area in April;
e) comprehensive aerial survey of Hudson Bay and Arctic ice conditions in May; and
f) continuous monitoring of satellite imagery--both visual and infrared--through the winter and spring.

The outlook is developed from this analysis of existing ice conditions, then applying the temperature and wind regimes predicted by current meteorological forecasts up to 30 days duration, assuming a reversion to near normal meteorological conditions for the remainder of the summer and early autumn, and an evaluation of the "normal" regional break-up patterns. It should be noted that significant departures from the meteorological conditions assumed in preparing this outlook can result in comparable differences in the extent and timing of break-up in particular areas.

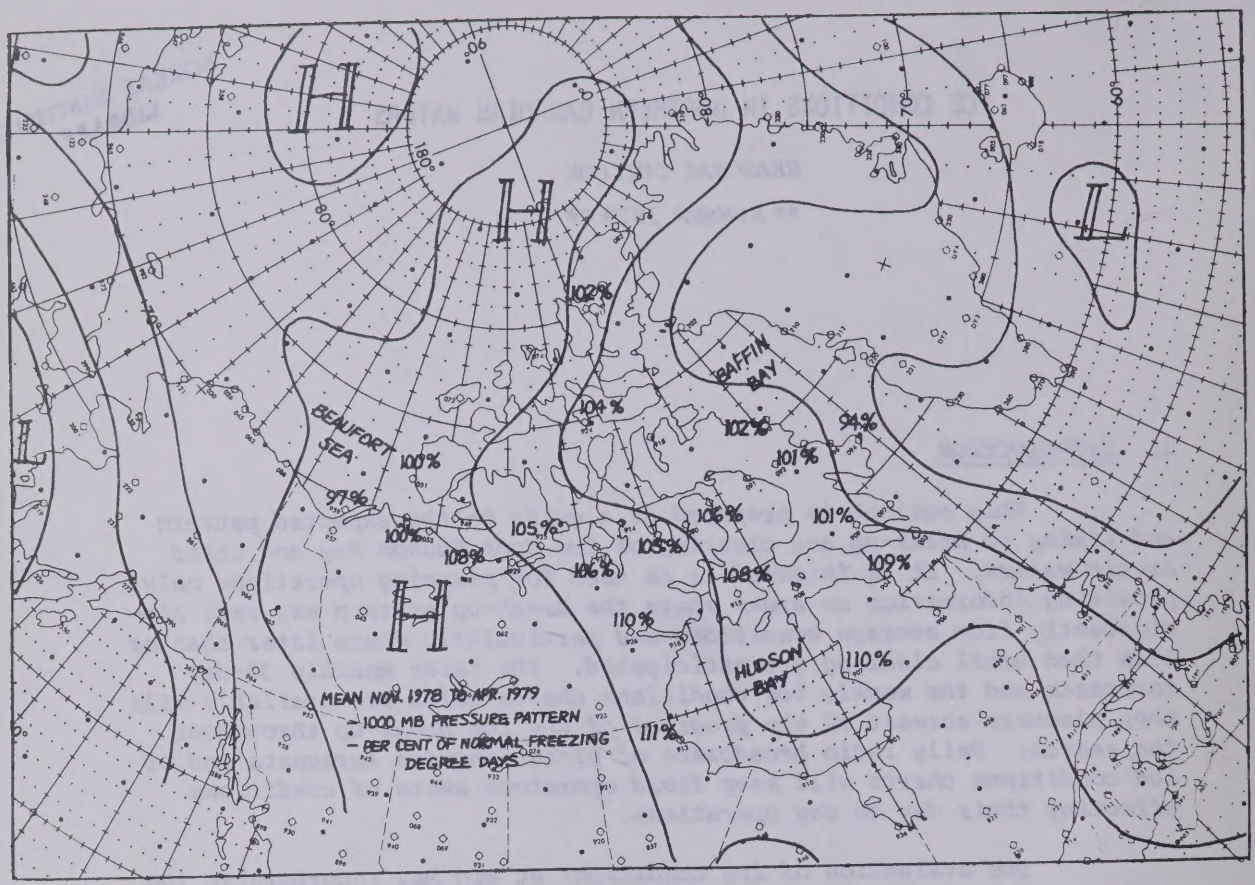


Figure 1

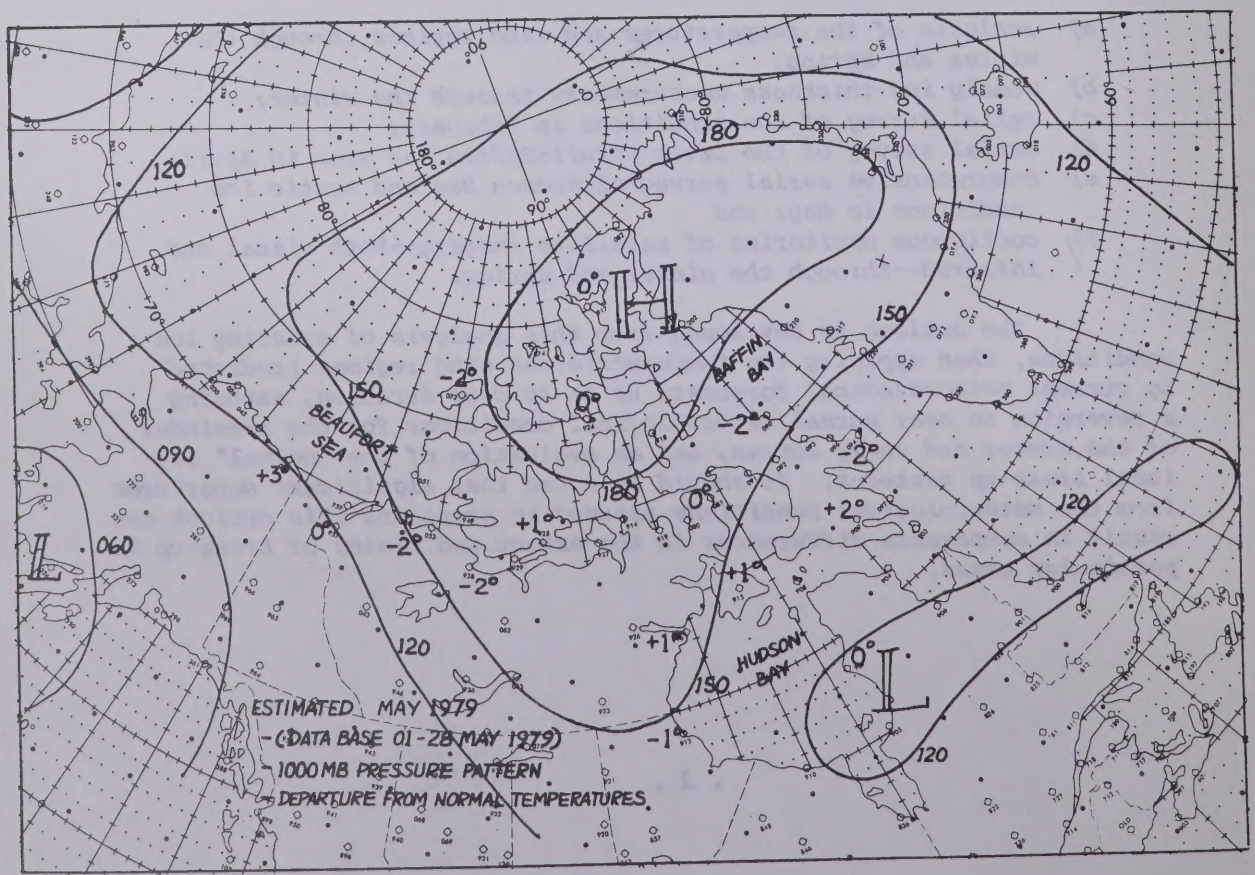


Figure 2

2. *GENERAL SEASONAL OUTLOOK*

During the winter, frequent periods of cold northerly windflow led to slightly higher than the normal accumulation of freezing degrees throughout all but the western Arctic Islands and the Beaufort Sea (Figure 1), and as a result an ice cover developed just a little thicker than normal in most places in the eastern Arctic and thinner than normal in the Beaufort Sea.

The May pressure pattern with a high centered over Ellesmere Island (Figure 2) resulted in near normal temperatures throughout most of the Arctic. Narrow areas of below normal temperatures, however, were evident from Amundsen Gulf to M'Clure Strait, and along the Baffin Island east coast. The Alaskan coast and Hudson Strait areas recorded temperatures above normal.

In June, temperatures are predicted to be near normal to above normal through the central Arctic and Foxe Basin, and above normal from Baffin Bay southward through Davis Strait, Hudson Strait and Hudson Bay. In the western Arctic, temperatures are forecast to be near normal.

Based on the analyses of past and current years' ice conditions, the above normal temperature trend for June, and the assumption of near normal meteorological conditions through July and August, the following trend in break-up is forecast:

i) an earlier than normal clearing of the Labrador coast, Davis Strait, Hudson Strait, Ungava Bay, and Baffin Bay;

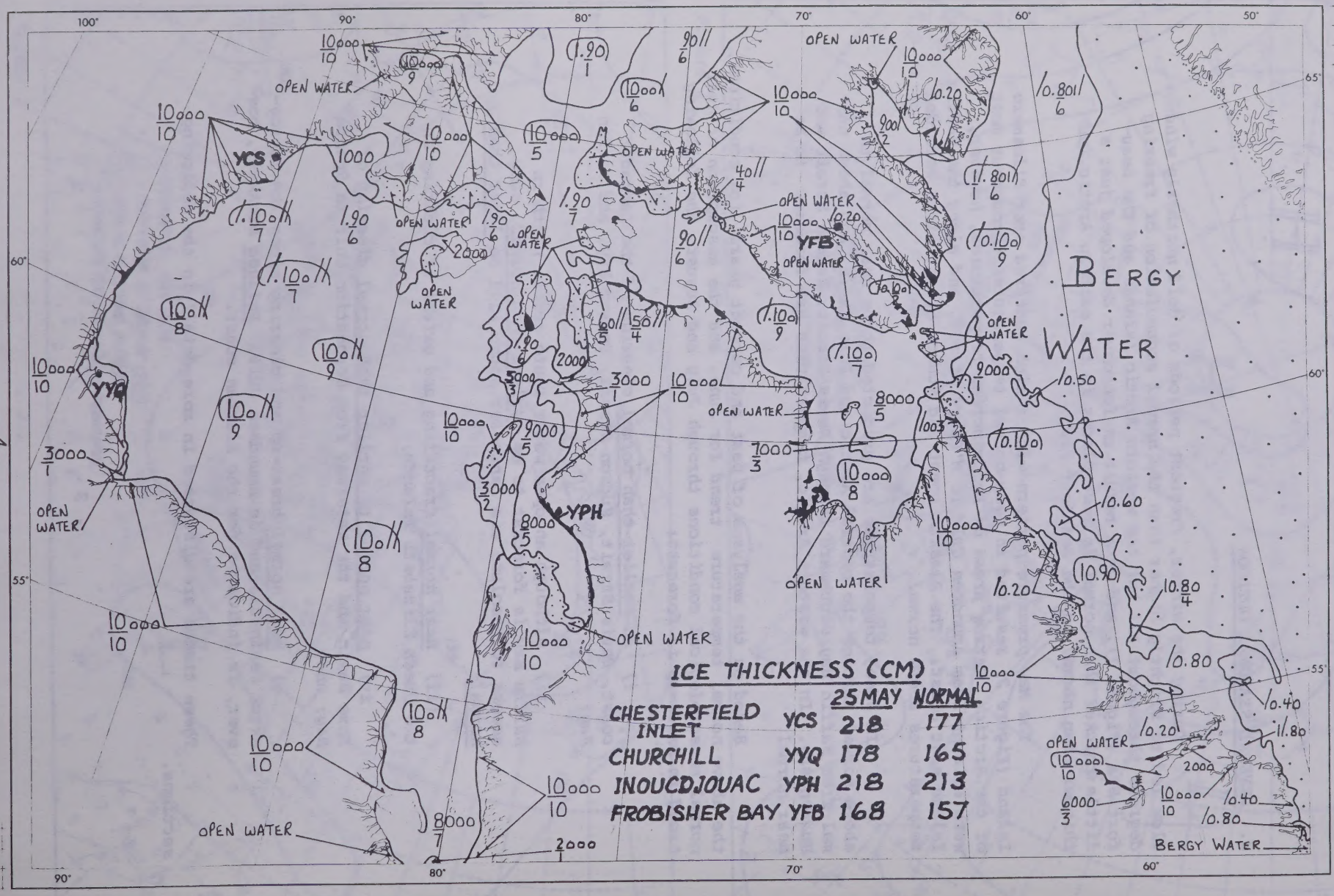
ii) although an open water route across northern Baffin Bay is forecast to be earlier than normal, easy access to Resolute via Lancaster Sound will be later than normal;

iii) near normal fracturing and extent of clearing in the Queen Elizabeth Islands;

iv) near normal to earlier than normal clearing of Foxe Basin and the waterway from Coronation Gulf to Spence Bay; and,

v) near normal break-up and clearing along the Tuktoyaktuk Peninsula and in Amundsen Gulf. Delayed break-up, however, is indicated for the Alaskan coast.

These trends are discussed in more detail in the following sections.



COMPOSITE ICE CHART MID MAY 1979

FIGURE 3

3. ICE CONDITIONS AND OUTLOOK

A. Hudson Bay and Approaches

i) Initial conditions and freeze-up

Last summer easy access to Frobisher came very early and complete clearing of Frobisher Bay was about a week earlier than normal. The shipping route to Churchill became open water ten days earlier than normal. All areas became open water. In mid September, however, ice remaining in Foxe Basin started moving into northeastern Hudson Bay and Hudson Strait.

A period of intense cold which began in October and continued through November caused an early and very rapid freeze-up. By the end of November Hudson Bay, Hudson Strait, and Davis Strait were extensively ice covered with young and first year ice, which was about a month earlier than normal.

ii) Observed ice conditions--figure 3

Note the following features:

a) the openings in Frobisher Bay and northern Hudson Strait are smaller than normal. In the immediate approaches to the Strait the ice edge is farther west than normal, and also west of last year's position;

b) there are significant openings in Hudson Bay and northeastern Ungava Bay;

c) ice thicknesses at Frobisher Bay, Chesterfield Inlet and Inoucdjouac at the end of May are thicker than normal;

d) a significant number of second year ice floes originating from Foxe Basin lie amongst the first year ice in Hudson Strait and northeastern Hudson Bay.

TABLE 1

HUDSON BAY AND APPROACHES

		1978	NORMAL	OUTLOOK FOR 1979
Frobisher Bay	- open pack or less	06 July	24 July	15-20 July
	- clearing	29 July	06 Aug.	25-30 July
Ungava Bay	- clearing	04 Aug.	10 Aug.	25-30 July
Hudson Strait	- clearing	14 Aug.	11 Aug.	01-05 Aug.
Open Water Route	To Churchill	23 July	03 Aug.	25-30 July
Hudson Bay	- clearing	16 Aug.	22 Aug.	20-25 Aug.
James Bay	- clearing	19 July	24 July	20 25 July

iii) Outlook

Above normal temperatures are forecast in June with earlier than normal clearing indicated in all areas. At the end of May the pack ice along the Labrador coast was less extensive than normal. The ice was confined to within 60-100 miles of the coast with the southern limit in the vicinity of Hamilton Inlet. Complete clearing of the Labrador coast is forecast by the end of June.

In Davis Strait the seaward extent of the pack ice was considerably narrower than normal. Frobisher Bay and Cumberland Sound, however, were more extensively ice covered than normal. The combination of the current ice conditions and the favourable meteorological outlook for June indicate an earlier than normal clearing of Davis Strait. Easy access to Frobisher Bay is forecast to develop near mid July and complete clearing during the last week of the month. Icebergs, however, will continue to pose a hazard.

The openings in Ungava Bay are presently more extensive than normal. Clearing is forecast to be one to two weeks earlier than normal. Through June very close pack first year ice will predominate in western and central sections with open water and loose ice gradually expanding in eastern and southeastern areas. Through July there will be a steady reduction in ice cover. Complete clearing of Ungava Bay is expected by the end of July.

Hudson Strait is predominantly very close pack first year ice with patches of open water along the Baffin Island coastline. Considerable expansion of the open water is forecast for the early part of June with a continuing but slower clearing throughout the latter half of June and early July. Complete clearing of the Strait is forecast to occur within the first week of August.

Above normal temperatures are expected to hasten the deterioration of ice throughout Hudson Bay with the clearing proceeding from the northeastern part of the Bay. The clearing trend should inhibit the ice from moving out of Foxe Basin thus allowing the shipping route to Churchill to become open water by 30 July, a few days earlier than normal.

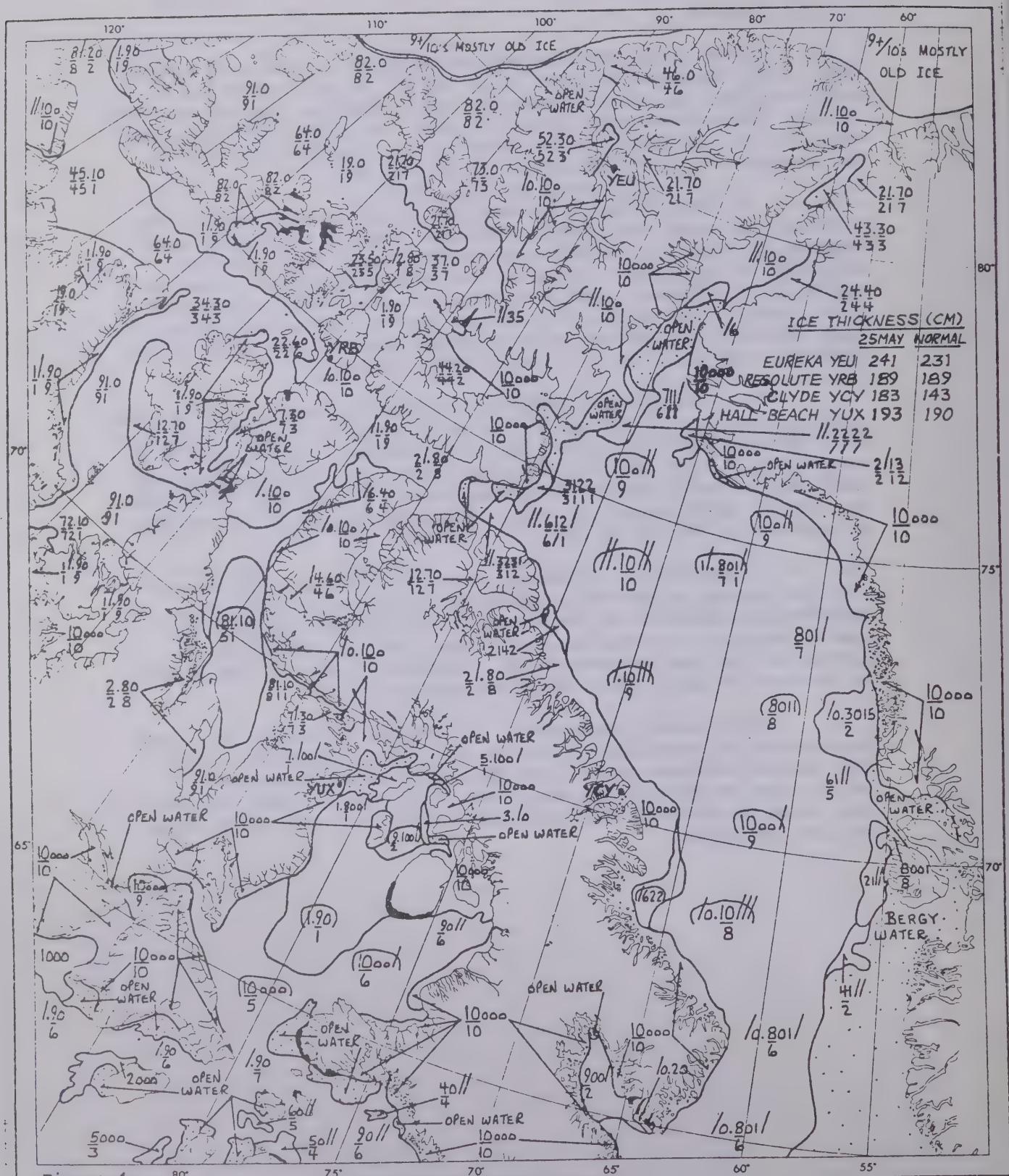

9+/10's MOSTLY OLD ICE
9+/10's MOSTLY OLD ICE
OPEN WATER
YEU
YRB
YCY
YUX
ICE THICKNESS (CM)
25MAY NORMAL
EUREKA YEU 241 231
RESOLUTE YRB 189 189
CLYDE YCY 183 143
HALL BEACH YUX 193 190
BERGY WATER
120°
110°
100°
90°
80°
70°
60°
80°
75°
70°
65°
60°
55°

Figure 4

B. Eastern Arctic

i) Initial conditions and freeze-up

Last summer the route through northern Baffin Bay to Lancaster Sound and Jones Sound became open pack or less nearly two weeks later and open water a month later than normal. In the high and central Arctic the cool summer led to difficult ice conditions during the navigation season. Considerable ice remained in Foxe Basin at freeze-up, with severe ice conditions enroute to Longstaff Bluff. In Davis Strait, however, access to Cape Dyer was possible through open pack about a month earlier than normal.

The record breaking cold of October which was experienced throughout the eastern half of the Arctic resulted in an early consolidation of the ice cover in northern areas and a very rapid spread and development of new ice. By the end of October Baffin Bay had become mostly ice covered, which was three to four weeks earlier than normal. Lancaster Sound for the second year in a row became consolidated. The ice bridge across Kane Basin developed later than normal and further north than normal.

ii) Observed ice conditions--figure 4

Note the following features;

a) the unusual extension of the north water into Kane Basin;

b) the consolidation of Lancaster Sound to Longitude 83W, an unusual occurrence in the climatological record but nevertheless almost identical to the mid May picture of last year;

c) a considerable amount of second year ice in Foxe Basin with the first year ice heavily ridged;

d) second and multi-year ice on the east side of Peel Sound and east side of Prince Regent Inlet;

e) multi-year ice in northern Eureka Sound in the approaches to Slidre Fiord;

f) mostly second year ice in southern Norwegian Bay and mostly multi-year ice in the northwestern part in the approaches to Massey Sound;

g) the ice is generally thicker than normal in most areas.

TABLE 2

EASTERN ARCTIC

		1978	NORMAL	FORECAST FOR 1979
Hall Beach	- open water route	None	05 Sep.	25-30 Aug.
Foxe Basin	- clearing	Never	01 Oct.	25-30 Sep.
Cape Dyer	- open pack or less	18 July	28 Aug.	20-25 Aug.
Home Bay	- open pack or less	29 Aug.	02 Sep.	25-30 Aug.
Northern Baffin Bay	- open pack or less	28 July	16 July	05-10 July
	- open water	28 Aug.	31 July	15-20 July
Pond Inlet	- fracture	01 Aug.	28 July	25-30 July
Lancaster Sound	- fracture	15 July	Usually Fractured	10-15 July
Admiralty Inlet	- fracture	27 July	23 July	20-25 July
	- open pack or less	28 Aug.	05 Aug.	05-10 Aug.
Barrow Strait to Resolute	- fracture	04 Aug.	12 July	25-30 July
Western	- fracture	04 Aug.	24 July	25-30 July
Wellington Channel	- fracture	17 Aug.	28 July	01-05 Aug.
Viscount Melville Sound	- fracture to Rea Point and Bridport Inlet	05 Aug.	01 Aug.	01-05 Aug.
Jones Sound	- fracture	16 Aug.	27 July	25-30 July
Norwegian Bay	- fracture			
Southern		27 July	26 July	15-20 July
Northern		16 Aug.	10 Aug.	05-10 Aug.
Eureka Sound	- fracture	28 July	22 July	20-25 July
	- open pack or less	06 Aug.	22 Aug.	15-20 Aug.

iii) Outlook

In Baffin Bay, the pattern of clearing is expected to proceed at a faster rate than normal. The open lead along the west Greenland coast which presently extends to near latitude 73N will expand northward to join with the open area in northern Baffin Bay near mid July. The open water in northern Baffin Bay will gradually expand southward along the east Baffin Island coast. Easy access to Home Bay is anticipated in the second half of August with complete clearing of Baffin Bay in early September.

Lancaster Sound, from 83W to Prince Leopold Island, is forecast to fracture by mid July, about the same date as last year. Barrow Strait is forecast to fracture completely by the end of July. Close pack ice in Lancaster Sound in late July is expected to reduce to predominantly open pack along the north side by mid August and mostly open pack throughout the Sound by the end of August. The ice in Wellington Channel, forecast to become mobile within the first week of August, will move out into Barrow Strait and pose difficulties for shipping into Resolute Bay.

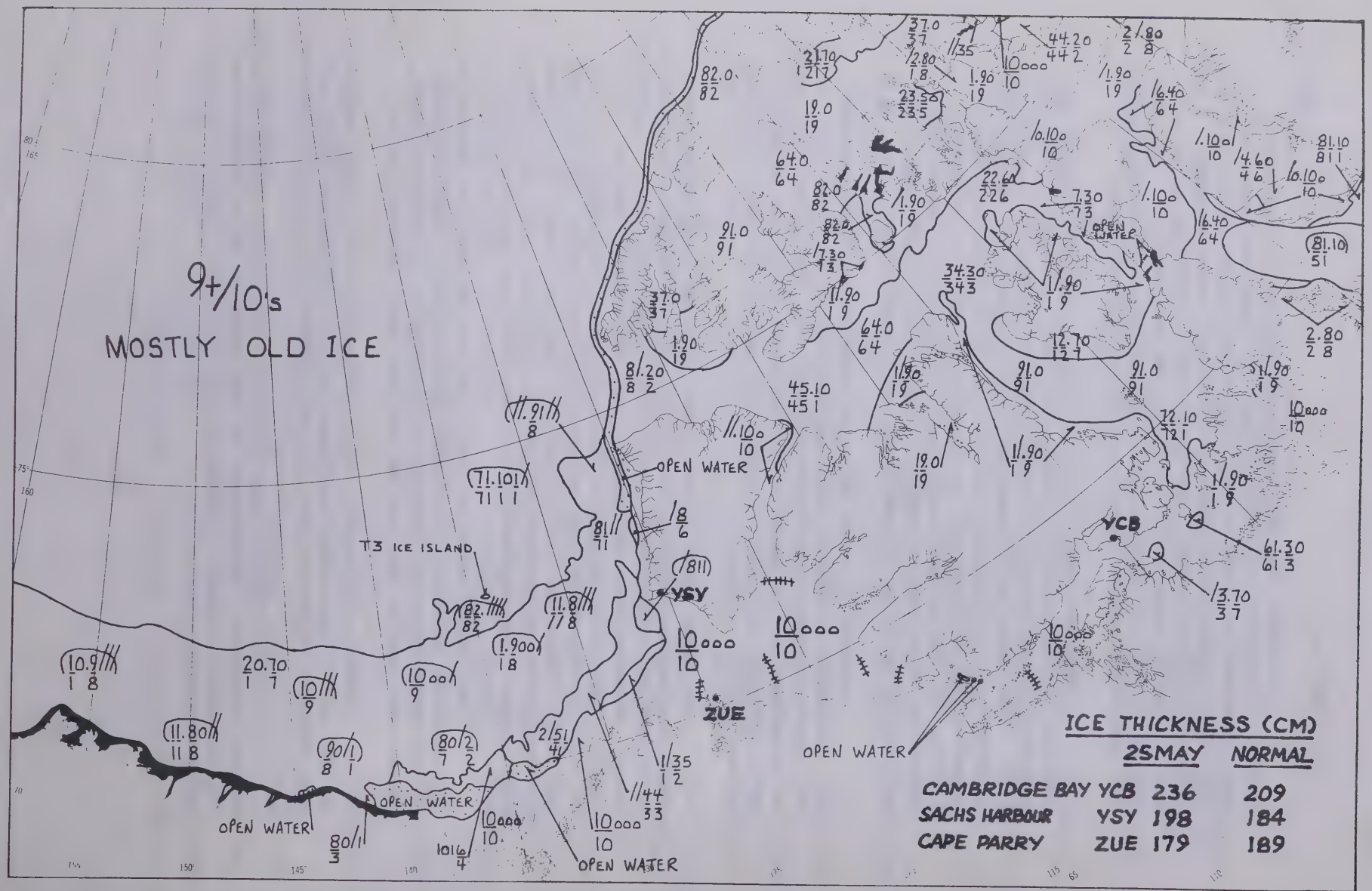
Viscount Melville Sound is forecast to fracture within the first week of August. Mostly open leads or very open pack ice will develop enroute Resolute to Rea Point by late August and through early September. The anticipated fracturing of the ice in Byam Martin Channel will cause intrusions of old ice into the approaches to Rea Point.

In Jones Sound a near normal break-up is forecast with easily navigable conditions developing along the north side by early to mid August. The fracture of all ice in Norwegian Bay is expected during the second week of August. Some loosening of the ice will develop through the balance of August and early September but areas of close to very close pack second year and multi-year ice will persist until freeze-up. During the third week of August the ice cover in Eureka Sound will reduce to open pack or less. Some heavier floes will linger in the approaches to Slidre Fiord and in Greely Fiord.

Admiralty Inlet and Pond Inlet are forecast to fracture in the last week of July with clearing by mid August. Peel Sound and Prince Regent Inlet are forecast to fracture in the first week of August, with mostly open pack or less developing by late August.

Break-up in Larsen Sound is expected to be an improvement on last year's impassable conditions but nevertheless the heavy concentration of multi-year ice will make transit of this area difficult.

In Foxe Basin, a near normal to earlier than normal dispersal of ice is forecast. Easy access to Hall Beach is anticipated during the last week of August. Clearing of Foxe Basin is expected by the end of September.



COMPOSITE ICE CHART MID MAY 1979 FIGURE 5

C. Western Arctic

i) Initial conditions and freeze-up

Break-up in the Beaufort Sea and along the shipping route to Spence Bay was later than normal. The Beaufort pack ice remained in close proximity to the Tuktoyaktuk Peninsula until late August then retreated steadily away from the coast through September. Multi-year ice drifting in Queen Maud Gulf from Victoria Strait created difficulties through the season.

At freeze-up, which began near normal in early October, the multi-year ice boundary in the Beaufort Sea lay in the vicinity of 72N. Freeze-up accelerated through October due to a more rapid drop than normal in seasonal temperatures. By the end of October the southern Beaufort Sea was ice covered with predominantly thin first year ice and the waterway from Coronation Gulf to Spence Bay had consolidated. Amundsen Gulf became consolidated in Febraury, a normal occurrence although in the past two years the ice has remained broken through the winter.

ii) Observed ice conditions--figure 5

Note the following features:

a) the open water and young ice, normally found only from Cape Kellett to Cape Bathurst, this year extends to west of Herschel Island;

b) ice island T-3 near 7246N 134W, located on the ice reconnaissance flight in May;

c) Amundsen Gulf ice is consolidated;

d) extensive cover of multi-year ice in Victoria Strait and Larsen Sound; patches of old ice in Queen Maud Gulf;

e) the ice is generally thicker than normal;

f) the extent of the fast ice along the Tuktoyaktuk Peninsula is similar to last year;

g) the edge of the multi-year ice lies north of 72N, north of its normal position.

TABLE 3

WESTERN ARCTIC

		1978	NORMAL	OUTLOOK FOR 1979
Mackenzie Delta	- clearing	19 June	10 June	01-05 June
Kugmallit Bay	- clearing	07 July	27 June	20-25 June
Tuktoyaktuk Peninsula	- fracture	15 July	30 June	25-30 June
Mackenzie Bay to Cape Bathurst	- open water route	07 Aug.	29 July	15-20 July
Booth Islands	- fracture	22 July	26 June	01-05 July
	- clearing	31 July	04 July	10-15 July
Amundsen Gulf	- fracture	Broken	06 July	10-15 July
	- clearing	22 Sep.	14 Aug.	10-15 Aug.
Coronation Gulf	- fracture	06 Aug.	15 July	15-20 July
	- clearing	25 Aug.	05 Aug.	05-10 Aug.
Route to Spence Bay	- open water	Never	18 Aug.	10-15 Aug.

iii) Outlook

In the Beaufort Sea the outlook for June calls for near normal temperatures and a resultant windflow from the east and northeast.

Along the Alaskan Coast from Barter Island to Point Barrow the onshore component of the wind forecast for June is expected to result in a delay of break-up. Coastal openings and leads will slowly develop through July with a navigable lead developing during the first half of August.

The open lead off the Tuktoyaktuk Peninsula will show some variation with changing windflow patterns but overall through June is expected to show no major change. The fast ice along the Tuktoyaktuk Peninsula is forecast to begin to fracture by mid June with complete loosening by the end of June. Clearing of the coastal waterway from the Mackenzie Delta to Cape Bathurst is forecast during the second week of July.

In Amundsen Gulf the consolidated ice cover in western sections will begin to loosen and drift out into the Beaufort Sea late in June. Complete fracturing of the ice in Amundsen Gulf is forecast by mid July with complete dispersal of the ice expected during the first half of August.

By mid July with the dispersal of the coastal ice the edge of the Beaufort pack ice is forecast to lie approximately 80-100 miles northwest of Tuktoyaktuk. Based on a near normal projection of temperature and windflow the pack can be expected to retreat slowly northwestward through the remainder of July and August.

Along the waterway from Coronation Gulf to Spence Bay fracturing of the consolidated ice is expected to begin during the first half of July. Complete clearing of Coronation Gulf is forecast during the first half of August. A mainly open water route to Spence Bay is expected by mid August. Intrusions of old ice into Queen Maud Gulf from Victoria Strait will pose a hazard throughout the season.

INTERPRETING CANADIAN ICE CHARTS

A unique digital code has been developed in Canada for depicting the total ice concentration in an area, the number of tenths of ice in each development stage (age), and the proportion of each age category with floe size in the medium floe (or greater) range (ie; over 100 m across).

The basis of the code is the reporting of the amount of ice in each of six age categories, in an invariable order. For sea ice these categories are:

my	sy	fy	gw	g	n

n - new ice

g - grey ice

gw - grey white ice

fy - first year ice

sy - second year ice

my - multi year ice

(see page A iii for definition of terms)

Ice Concentration and Stage of Development (Age)

The initial development stage - new ice - is always in the units column, grey ice is always in the tens column, first year ice is always in the thousands column, etc. Older forms of ice, if not present in an area, should be represented by a zero, but in practice, they are not reported.

Thus: 8000 indicates 8/10 of first year ice, with no other ice present.

62 indicates 8/10 ice cover, 6/10 being grey ice and 2/10 being new ice.

5 indicates 5/10 of new ice and nilas, with no other ice present.

In southern Canadian waters where second year and multi year ice are not normally encountered, the numerical code is compact and convenient. In the Arctic area, where the oldest ice growth stages can be encountered, and where ice development stages younger than first year may not be found for much of the year, a report like 514000 showing 10/10 ice cover would be common. A coding of 91000 could also be found.

To make these coded values more manageable, a second reference mark is introduced. Where 'old' ice forms are being reported, a decimal point is placed between the digits showing amounts of first year ice and second year ice present, and this becomes an integral part of the code where second year and/or multi year ice is reported. Thus, 35.0000 would indicate 3/10 of multi year ice and 5/10 of second year ice, with no first year, grey white, grey, or new ice. Now, using this reference mark, we are able to drop the zeros which show no ice of the younger ages (but we must retain at least one figure to the right of the decimal point). Now 35.0 can represent the same ice types as in the previous example. Note, however, when new ice begins to form in this area, the full code must be used: 35.0001 (with the decimal retained). This would be a normal type of report from the Queen Elizabeth Islands area during the initial stage of freeze-up.

Now 21.4102 shows a complete ice cover made up as follows:

2/10 of multi year ice, 1/10 of second year ice,
4/10 of first year ice, 1/10 of grey white ice,
no grey ice, and 2/10 of new ice.

As shown, this would indicate a compact or a consolidated ice cover. If any floe motion is visible or if any water openings exist, this is indicated by circling the figure thus: (21.4102). This condition is referred to as nine plus tenths (9+/10).

Floe Size

As the ice concentration in an area increases to 50 per cent or more, the size of the ice floes in the pack (see definitions page A iv) begin to have a more significant effect on navigation. Even at low concentrations, larger floes may pose a serious threat to stationary drill rigs. Our code makes provision for reporting the proportion of floes in each age category which are medium floe size or larger (over 100 m across). This is done by using a second line in the digital report, as follows:

2.4101 *1 3*	*indicating total ice cover of 8/10; 2/10 second year ice of which 1/10 (or 50 per cent) of the floes are medium floe size or greater; 4/10 first year ice of which 3/10 (or 75 per cent) are medium floe size or greater, 1/10 grey white ice and 1/10 new ice of which all floes are smaller than medium floe size.*

Other Features

a) A solidus (/) is used to indicate the presence of some floes but less than 1/10 of any age category. (40/1 - 4 tenths first year ice; less than 1 tenth grey ice; 1 tenth new ice - total is 5 tenths ice cover).

b) To distinguish between 1 tenth of an age category and 10 tenths of the next younger category, a change in size of zeroes of the younger ages is manditory. Thus, 1000 shows 1 tenth of first year ice, but 10oo indicates 10 tenths of grey white ice.

c) A hatching pattern has been devised which is based on the total amount of ice present and the predominant age of the ice. This was designed on the basis of restriction to navigation presented by the ice and, to some extent, incorporates floe size.

d) Fast ice areas are generally indicated by a solid black shading.

DEVELOPMENT STAGES (AGES) OF SEA ICE

New Ice: A general term for recently formed ice which includes frazil ice, grease ice, slush, and shuga. These types of ice are composed of ice crystals which are only weakly frozen together (if at all) and have a definite form only while they are afloat.

Frazil Ice: Fine spicules or plates of ice suspended in water.

Grease Ice: A later stage of freezing than frazil ice when the crystals have coagulated to form a soupy layer on the surface. Grease ice reflects little light, giving the sea a matte appearance.

Slush: Snow which is saturated and mixed with water on land or ice surfaces, or as a viscous floating mass in water after a heavy snowfall.

Shuga: An accumulation of spongy white ice lumps, a few centimeters across; formed from grease ice or slush and sometimes from anchor ice rising to the surface.

Nilas: A thin elastic crust of ice, easily bending on waves and swell and, under pressure, thrusting in a pattern of interlocking 'fingers' (finger rafting). Has a matte surface and is up to 10 centimetres in thickness.

Ice Rind: A brittle shiny crust of ice formed on a quiet surface by direct freezing or from grease ice, usually in water of low salinity. Thickness to about 5 centimetres. Easily broken by wind or swell commonly breaking into rectangular pieces.

Young Ice: Ice in the transition stage between nilas and first year ice, 10 to 30 centimetres in thickness. May be subdivided into grey ice and grey white ice.

Grey Ice: Young ice 10 to 15 centimetres thick. Less elastic than nilas, and breaks on swell. Usually rafts under pressure.

Grey White Ice: Young ice 15 to 30 centimetres thick. under pressure more likely to ridge than to raft.

First Year Ice: Sea ice of not more than one winter's growth, developing from young ice; thickness from 30 centimetres to 2 metres or more.

Old Ice: Sea ice which has survived at least one summer's melt. Most topographic features are smoother than on first year ice. May be subdivided into second year ice and multi year ice.

Second Year Ice: Old ice which has survived only one summer's melt. Because it is thicker and less dense than first year ice, it stands higher out of the water. In contrast to multi year ice, summer melting produces a regular pattern of numerous small puddles. Bare patches and puddles are usually greenish-blue.

Multi Year Ice: Old ice up to 3 metres or more thick, which has survived at least two summers' melt. Hummocks even smoother than on second year ice, and the ice is almost salt-free. Colour, when bare, is usually blue. Melt pattern consists of large interconnecting irregular puddles and a well-defined drainage system.

Fast Ice: Sea ice which forms and remains fast along the coast, where it is attached to the shore, between shoals or grounded icebergs. Fast ice may be formed in situ from freezing of sea water, or by freezing of pack ice to the shore. It may extend a few metres or several hundred kilometres from the coast, and it may be more than one year old (second year or multi year fast ice).

Floe Sizes

Floe: Any relatively flat piece of ice 20 m or more across. Floes are subdivied according to horizontal extent as follows:

Giant Floe:	Over 10 km across.
Vast Floe:	2 - 10 km across.
Big Floe:	500 - 2000 m across.
Medium Floe:	100 - 500 m across.
Small Floe:	20 - 100 m across.
Ice Cake:	Any relatively flat piece of ice less than 20 m across.

Small Ice Cake: An ice cake less than 2 m across.

Brash Ice: Accumulations of floating ice made up of fragments not more than 2 m across; the wreckage of other forms of ice.

Ice Concentration Ranges

Consolidated Pack Ice: Pack ice with concentration 10 tenths and ice floes are frozen together.

Compact Pack Ice: Pack ice with concentration 10 tenths, no water is visible but floes are not frozen together.

Very Close Pack Ice: Pack ice with concentration 9 to 9+ tenths.

Close Pack Ice: Pack ice with concentration 7 through 8 tenths composed of floes mostly in contact.

Open Pack Ice: Pack ice with concentration 4 through 6 tenths, many leads and polynyas, and floes generally not in contact with one another.

Very Open Pack Ice: Pack ice with concentration 1 through 3 tenths; water preponderates over ice.

Open Water: Area of freely navigable water with less than 1 tenth ice present. There may be icebergs and growlers in the area.

Bergy Water: Area of freely navigable water with no sea ice but there are icebergs and growlers present.

Ice Free: No ice of any kind present in the area.

TOPOGRAPHY

$\frac{\Lambda\Lambda}{n}$ *Rafted Ice*

$\frac{\wedge\wedge}{n}$ *Ridged Ice*

$\frac{\Omega\Omega}{n}$ *Hummocks*

n *Number of tenths*

PRESSURE RIDGE DATA

$\frac{h_m f}{h_x}$ *Mean Ridge Height (metres) / Maximum Ridge Height (metres) . frequency per nautical mile*

■ *Fast Ice*

Issued by: Ice Forecasting Central,
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K1A 0H3

Telephone: (613) 996-5236

Telex: 053-3761

31 May 1979